VI Semester Syllabi – Civil Engineering

Sr. No.	Course Code	Course Name	L	T	P	Credits
1.	CE3CO07	Water Resources Engineering	3	1	0	4
2.	CE3CO11	Structural Analysis-II	3	1	0	4
3.	CE3CO14	Design of Steel Structures	3	1	2	5
4.	CE3CO16	Civil Engineering Software Lab	0	0	2	1
5.	CE3E***	Elective-IV	3	0	0	3
6.	EN3MC03	Technical Communication	2	0	0	0
7.	EN3MC04	Human Values and Ethics	2	0	0	0
8.	EN3OE**	Open Elective-I	3	0	0	3
9.	EN3OE**	Open Elective-II	3	0	0	3
		Total	22	2	4	23
		Total Contact Hours	29			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3CO07	Water Resources Engineering	3	1	0	4

Unit- I

Hydrology: Introduction to hydrology, Hydrologic cycle, The water Budget, Concept and characteristics of watershed, Precipitation, Measurement of rainfall, Rain-gauge network, Estimation of missing rainfall data, Computation of average rainfall, Presentation and interpretation of rainfall data, Evaporation, Infiltration and infiltration indices, Runoff, Computation of run-off, Hydrograph analysis, Unit hydrograph and its derivation from isolated and complex storms, S-Hydrograph, Synthetic unit hydrograph.

Unit- II

Floods: Introduction to flood, Types of floods, Peak flow determination, Empirical formulae for flood discharge, Flood frequency studies, Gumbel's method, Flood discharge by rational formula, Flood control measures, Flood routing through reservoirs and channels.

Unit- III

Ground Water and Well irrigation: Introduction to ground water, Some definitions, Divisions of sub-surface water, Types of Aquifers, Storage coefficient, Well hydraulics, Determination of aquifer constant T, Characteristic well losses, Interference among well, Tube wells, Methods for drilling tube wells, Open well, Yield of an open well, Methods of lifting water, Advantages and disadvantages of well irrigation over canal irrigation, Selection of suitable site for a tube well, Other sources of underground water, Water logging, Salt efflorescence, Reclamation of water logged and salt affected lands, Groundwater Recharge, Rainwater harvesting.

Unit- IV

Irrigation Water Requirement and Soil-Water-Crop Relationship: Introduction to Irrigation, Definition, Necessity, Benefits of irrigation, Ill-effects of irrigation, Types of irrigation, Methods of irrigation, Functions of irrigation water, Quality of irrigation water, Types of Soils, Preparation of land for irrigation, Classes and availability of soil water, Limiting soil moisture conditions, Depth and frequency of irrigation, Principal crops and crop seasons, Duty and delta, Factors affecting duty, Methods of improving duty, Definitions of irrigation terminologies, Consumptive use of water, Irrigation efficiencies, Crop rotation, Assessment of irrigation water.

Unit-V

Canal Irrigation: Introduction to canal irrigation, Classification of canals, Canal alignment, Types of irrigation channels, Design of alluvial channels, Kennedy's Theory, Kennedy's method of channel design, Lacey's regime theory, Lacey's theory applied to channel design, Comparison of Kennedy's and Lacey's Theories, Introduction to sediment transport, Losses in canals, Lining of irrigation channels, Introductions to

Hydraulic Structures viz. Dams, Spillways, Weirs, Barrages, Canal Regulation Structures.

Text Books

1. Dr. B.C.Punmia, "Irrigations and Water Power Engineering," Laxmi Publications Ltd.
2. K.Subramanya, Engineering Hydrology, Tata McGraw-Hill Education.
3. Santosh Kumar, Hydrology & Flood Control - Khanna Publishers.

Reference Books

1. Santosh Kumar Garg, "Irrigation Engineering & Hydraulic Structures," Khanna Publishers.
2. R.S.Varshney ,Engineering Hydrology, Nem Chand & Brothers.
3. Prof. K.N.Dugal& Prof. J.P. Soni, "Elements of Water Resource Engineering," New age international publishers.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3CO14	Design of Steel Structures	3	1	2	5

UNIT-I
Moment distribution method for analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

UNIT-II
Matrix method of structural analysis: force method and displacement method

UNIT-III
Analysis of tall frames, wind and earthquake loads, codal provision for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads

UNIT-IV
Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam – Columns

UNIT-V
Plastic analysis of beams and frames.

Text Books

1. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications
3. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi

References Books

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
3. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3CO16	Civil Engineering Software Lab	0	0	2	1

Proposed List of Practical

1. Introduction to drafting software (Auto-Cad)
2. Uses of different commands in Auto-Cad
3. Creation of simple building plan in Auto-Cad
4. Creation of multistory plan in Auto-Cad
5. Introduction to Isometric drawing
6. Creation of plan in Isometric View
7. Prepare typical Drawings using Different Layers
8. Develop final Drawings with Dimension, Text and Hatching
9. Setup printer , plotter for printing of drawings
10. Introduction to 3D drawing commands

Text Books:

1. Shantikoo , AutoCAD – A problem solving Approach ,AutoDesk
2. George Omura, Mastering AutoCAD , Wily India
3. Raheinstein ,AutoCAD, Delmar

Reference Books:

1. Linkan Sagar, Auto CAD 2018, BPB Publication
2. Bhanu Prakash Yadav, Easy AutoCAD, Educreation Publishing
3. Mercury Learning, AutoCAD 2016 3D Modeling, BPB Publication

List of Program Elective

Programme Elective (PE)								
S.No.	Course Code	Course name	L	T	P	Credit	Preferred Semester	Specialization
1	CEPEL01	Environmental Engineering (Already approved)	3	0	0	3	V	Structural Engineering
2	CEPEL04	Building Maintenance & Repairs (Already approved)	3	0	0	3	VI	
3	CEPEL07	Transportation Bridges & Tunnels (Already approved)	3	0	0	3	III	
4	CEPEL02	Advanced Geotechnical Engineering	3	0	0	3	VI	
5	CEPEL03	Advanced Design of RCC Structures	3	0	0	3	III	
6	CEPEL05	Advanced Design of Steel Structures	3	0	0	3	VII	
7	CEPEL06	Bridge Engineering	3	0	0	3	VII	
8	CEPEL08	Ground Improvement Techniques	3	0	0	3	V	
9	CEPEL09	Earthquake Resistant Design	3	0	0	3	VII	
10	CEPEL10	Experimental Stress Analysis	3	0	0	3	VI	
11	CEPEL11	Prestressed Concrete	3	0	0	3	V	
12	CEPEE01	Air & Noise Pollution	3	0	0	3	VII	Environmental Engineering
13	CEPEE02	Energy Efficient Buildings	3	0	0	3	VI	
14	CEPEE03	Environment and Energy Studies	3	0	0	3	V	
15	CEPEE04	Environmental Impact Assessment	3	0	0	3	IV	
16	CEPEE05	Hazardous & Bio Medical Waste Management	3	0	0	3	V	
17	CEPEE06	Industrial Waste Water Management	3	0	0	3	VII	
18	CEPEE07	Planning for Sustainable Development	3	0	0	3	IV	
19	CEPEE08	Solid Waste Management	3	0	0	3	VII	
20	CEPEL01	Environmental Engineering (Already approved)	3	0	0	3	V	
21	CEPEL02	Disaster Management	3	0	0	3	VI	
22	CEPEL04	Building Maintenance & Repairs (Already approved)	3	0	0	3	VI	
23	CEPEL07	Transportation Bridges & Tunnels (Already approved)	3	0	0	3	III	
24	CEPEC01	Advanced Construction Equipment & Materials	3	0	0	3	III	Construction Management
25	CEPEC02	Construction Law & Regulation	3	0	0	3	VII	
26	CEPEC03	Construction Equipment & Materials	3	0	0	3	V	
27	CEPEC04	Construction Material Management	3	0	0	3	VI	
28	CEPEC05	Construction Project Management	3	0	0	3	III	
29	CEPEC06	Construction Quality Control & Management	3	0	0	3	VII	
30	CEPEC07	Construction Safety & Management	3	0	0	3	IV	
31	CEPEC08	Energy Conservation Techniques in Building Construction	3	0	0	3	VI	
32	CEPEL01	Environmental Engineering (Already approved)	3	0	0	3	V	
33	CEPEL02	Disaster Management	3	0	0	3	VI	
34	CEPEL04	Building Maintenance & Repairs (Already approved)	3	0	0	3	VI	
35	CEPEL07	Transportation Bridges & Tunnels (Already approved)	3	0	0	3	III	

Syllabi of Programme Electives

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3ES03	Advanced Design of Steel Structures	3	0	0	3

UNIT-I
Plate girder bridges (Riveted and welded)

UNIT- II
Trussed girder bridges for railway and highways (IRC & IRS holding). Types of bearing for bridges, sliding, rocker and pin, Roller, Elastomeric, Curve, Pot & Disk. Design of Rocker and Pin bearing.

UNIT-III
Details of components of industry building, and design of industry building with all components like purlins, Rafter, Roof bracing, Roof Truss, Column, Base plate anchore and connection etc. Apex Hauner, Tubelar truss.

UNIT-IV
Chimneys: Guyed and self supporting steel stacks.

UNIT V
Bunkers, Silos & types of Towers and design of lattice towers.

Text Books
1.S. Ramamrutham, Design of steel structures, Dhanpat Rai Publication.
2. B.C. Punmia, Design of steel structures, Laxmi Publication .
3. Ramchandra, Design of steel structures Vol. I &II , Scientific Publication, Jodhpur.

Reference Books
1. L.S. Negi, Design of steel structures, MC graw Hill Education.
2. N. Subramanian, Design of steel structures, Oxford University
3. Arya & Ajmani, Steel Structure, New Chand & Brothers

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EC01	Advanced Construction equipment's & materials	3	0	0	3

UNIT I Modern Construction Materials: Polymers in civil engineering-structural plastics and composites- polymer membranes coatings-adhesives, nano - weathering materials-flooring and facade materials- glazed brick, composite fiber, water jet cut stainless steel, mill slab steel and heat treatment in steels.

UNIT II Smart Materials : concept and types, sensing technology-types of sensors – physical measurement using piezoelectric strain measurement, piezoelectric and electrostrictive material - magneto structure material, shape memory alloys, electro rheological fluids The use and properties of materials used in Retrofitting- FRP, CFRP and GFRP, epoxy resin.

UNIT III Construction Equipment's Excavation by Blasting-chiseling and other excavation equipment's, blasting theory, rock excavation, basic mechanics of breaking, Aggregate production equipment-crusher-types and size ,Pile and Pile driving equipment's and its methods.

UNIT IV Construction Equipment's Dozers, Scrapers, and Excavators: Introduction, Performance Characteristics of Dozers, Pushing Material, Land Clearing, Scraper types, operation, Performance Charts, Production cycle, Hydraulic Excavators, Shovels, and Hoes

UNIT V Construction methods: Precast flat panel system, 3d volumetric construction, tunnel boring methods, slip form work, precast foundations fabrication of pre-cast work, reinforcing steel: types, bending, placing, splicing and spacing.

Text Books

1. Sharma S.C. "Construction Equipment and Management ", Khanna Publishers New Delhi
2. Dewatering: New Methods and Applications, John Wiley and Sons
3. Mohan, R. and Jaisingh, M.P., Advances in Building Materials and Construction, CBRI Roorkee.
4. J.Irvine,Advanced Construction Techniques, California Rocketry.

Reference Books

1. Peurifoy, R.L., "Construction Planning Equipment and Methods ", Ledbetter, W.B. and Schexnayder, C, 5th Edition, McGraw Hill, Singapore.
2. Brown, R., Practical foundation engineering hand book, McGraw Hill Publications.
3. National Building Code of India, Part-IV and VII – 2006.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES02	Advanced Design of RCC Structures	3	0	0	3

UNIT -I

Building Frames- Introduction to building frames, Various load combinations, Substitute method of frame analysis, Portal frame method, Cantilever method,and design of frames,Design of shear walls

UNIT -II

Earth Retaining Structures: Cantilever and counter fort type retaining walls.

UNIT -III

Design of Circular Water Tanks-Water tanks: Design criteria, material specifications and Permissible stresses for water retaining structures, Design of circular water tanks with fixed & flexible base situated on the ground/underground

Design of Rectangular Water Tanks-Design of square /rectangular tanks situated on the ground/underground using approximate method and IS-code method.

Overhead tanks: Circular and Intze tanks.

UNIT -IV

Silos and Bunkers: Introduction, difference between Bunker and Silo, design of bunkers(Single Unit), design of silos by Airy's theory and Janssen's theory.

UNIT -V

T-beam & Slab bridges-for highway loading (IRC Loads). Principles of prestressed concrete design, materials, methods of prestressing, losses, Analysis of beam sections at transfer and service loads, Design of simple members and determinate structures, Introduction to working and limit state design.

Text Books

1. J. Krishna and O.P. Jain, Plain and Reinforced Concrete,Vol. I and II, Nemchand Bros, Roorkee.
2. Advanced reinforcement concrete design Krishnaraju, CBS Publisher
3. Jain, A.K., "Reinforced Concrete Limit State Design", 7th Ed., Nem Chand & Bros., Roorkee.

Reference Book

1. IS 456: 2000, Code of Practice for Plain and Reinforced concrete.
2. Pillai, S.U. and Menon, D., "Reinforced Concrete Design", Tata McGraw-Hill.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3ES01	Advanced Geotechnical Engineering	3	0	0	3

UNIT - I

Shallow Foundation: Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi's, Meyerhoff's and Skempton's Methods

UNIT - II

Deep Foundation: Pile foundation. Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae ,Pile load test. Settlement of pile group. Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons.

UNIT - III

Soil Improvement Techniques : Compaction. Methods(Field and laboratory),Factors affecting compaction. Field compaction control. Lift thickness.

Soil stabilisation: Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electricalstabilisation and stabilisation by grouting. Geo-synthetics, its types, functions, materials and uses.

UNIT - IV

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

UNIT - V

Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads. Cofferdams, materials, types and applications.

Modes of vibration. Mass-spring analogy. Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

Text Books

1.C.Venkataramaiah, Geotechnical Engineering,New AGE International Publishers, Delhi

2. V.N.S.Murthy, Foundation Engineering ,CRC Press, New Delhi.

3.GALeonards ,Found. Engg. ,McGraw Hill Book Co. Inc.

4. Relevant IS Code

Reference Books

1.GALeonards ,Soil Mechanics & Foundation Engg.- Std. Publishers Delhi

2. B.C. Punmia Soil Mechanics & Foundation Engg. - Laxmi Publications Delhi

3. Dr. Alam Singh,Modern Geotech. Engg. IBT Publishers Delhi.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE5EE01	Air and Noise Pollution	3	0	0	3

UNIT I INTRODUCTION TO AIR POLLUTION

Air Pollution, Definition, Air Pollution and Global Climate, Units of measurements of pollutants, Air quality criteria, emission standards, National ambient air quality standards , Air pollution episodes.

UNIT II SOURCES, CLASSIFICATION AND EFFECTS

Sources and classification of air pollutants, Manmade, Natural sources. Type of air pollutants, Pollution due to automobiles, Analysis of air pollutants.Air pollution and its effects on human beings, plants and animals, Economic effects of air pollution.

UNIT III AIR QUALITY SAMPLING AND MONITORING

Ambient air sampling.Stack sampling, instrumentation and methods of analysis of gaseous pollutants.Meteorology, legislation for control of air pollution and automobile pollution.

UNIT IVAIR POLLUTION CONTROL MEASURES

Control equipment, Particulate control methods, Baghouse filter, Settling chamber, cyclone separators, inertial devices, Electrostatic precipitator, scrubbers, Control of gaseous emissions, Absorption, Absorption equipment's, adsorption and combustion devices.

UNIT V NOISE POLLUTION AND ITS CONTROL

Sources of noise, Units and Measurements of Noise, Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise, Noise measuring equipment, Effects of noise pollution, Prevention and control of noise pollution.

Text Books

1. S.K. Garg, Khanna publishers, Sewage Disposal and Air Pollution Engineering.
2. S.M. Khopkar, Environmental pollution analysis, New Age International Publisher.
3. Balram Pani , Environmental engineering, New Age International Publisher.

References books –

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt. Ltd, New Delhi.
3. G.K. Nagi, M.K. Dhillon, G.S. Dhaliwal, Commonwealth Publishers, Noise Pollution.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES04	Bridge Engineering	3	0	0	3

UNIT – I
Introduction, Type of Bridges, Economic spans, Aesthetics, requirements in bridge design, selection of suitable types of bridge, Bridge codes

UNIT –II
Design loads and their distribution – IRC Load, Railway loading systems, Analysis of deck slab, Load distribution in longitudinal beams of a bridge, Introduction to pre stressed methods of design.

UNIT –III
Design of superstructure- Design of balanced cantilever concrete bridge, Introduction to design of RC Arch bridge, Box girder bridge, Bridge vibration.

UNIT-IV
Design of substructure – Different types of foundation, Their choice and method of construction, Design of well foundation, Design of Piers and abutments, types of bearings and design of pot bearing.

UNIT – V
Construction Method Erection of bridge superstructures, Cantilever bridge construction methods, grillage analysis, Cable Stayed and suspension bridge analysis.

Text Books

1. Raina V. K., Concrete Bridge Practices, TMH
2. Jagadeesh T. R. and Jayaram, M. A., Design of Bridge Structure, Phi Learning
3. Bindra S. P., Principles and Practice of Bridge Engineering, Dhanpat Rai Publication

Reference Books

1. Victor D. J., Essentials of Bridge Engineering, Oxford & IBH
2. Raju N. K., Design of Bridges Oxford & IBH
3. Ponnuswamy S, Bridge Engineering, TMH.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES05	**Concrete technology**	3	0	0	3

UNIT I Fresh concrete Properties of fresh concrete. Definition and Measurement methods of workability as per IS and ASTM standards, factors affecting workability, Segregation & Bleeding, Slump loss, Re-tempering, Site preparations for concreting, Mixing, Conveying, Placing, Compaction, Finishing of concrete. Curing & various methods of curing.

UNIT II Hardened Concrete:
Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS and ASTM. Failure mechanism under compression & tension, Stress-strain behaviour of concrete, Overview of Modulus of elasticity, Dimensional stability Creep & Shrinkage

UNIT III Concrete Mix Design Principles of concrete mix design, Parameters and factors influencing mix design, Indian Standard methods of mix design, Acceptability criteria, variability of results, Various provisions of IS code for sound concrete.

UNIT IV Special concrete and concreting methods advanced cement based composites, Fibre reinforced concrete, Polymer modified concrete, Self-compacting concrete, Light weight concrete, High strength concrete, Light-weight & heavy weight concrete, High volume fly ash concrete.Special concreting methods: Pumped concrete, Ready mix concrete, Under-water concreting, Hot & cold weather concreting, Precast concrete.

UNIT V Non-Destructive testing of concrete Introduction to Destructive, semi-destructive & Non-destructive testing methodology, Problems faced during Non-destructive evaluation, Test methods like Rebound Hammer test, Ultra-sonic pulse velocity, Penetration tests, Pull out tests.
Overview of Fracture Mechanics – Origin of fracture mechanics, Understanding the quasi-brittle nature of concrete, Failure of concrete under low stress, Micro—cracking, crack propagation, stress concentration at openings.

Text Books

1. Concrete technology by MS Shetty- S Chand &Co.
2. P.K. Mehta and P.J.M. Monteiro, "Concrete Microstructure, Properties and Materials", Third Edition,Tata McGraw Hill.
3. ML Gambhir, Concrete Technology, Tata McGraw Hill

Reference Books

1. A.M. Neville and J.J. Brooks, "Concrete Technology", Pearson Education Ltd.
2. AR Santakumar, Concrete Technology, Oxford University Press
3. Ken W. Day,Concrete Mix Design, Quality Control and Specification,Taylor & Francis Group

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EC03	Construction Equipment and Materials	3	0	0	3

Unit I Construction Materials Mixing concrete techniques, ready mixed concrete, central mixed concrete, concrete pumps, Special alloys of steel,tension rods assemblies,Pre-stressingtendons, AAC blocks, fly ash bricks, latest prevailing building materials.

Unit IIStudy of building materials: Aluminum, glass, types of finishes & treatmentsin Buildings, construction chemicals – sealants, grouts and grouting methods, admixtures and adhesives.

Unit III Construction Equipment's: Equipment for excavating-Power shovel, Backhoe, Dragline, Clamshell.
Hoisting Equipment- Mobile cranes, crawler cranes, telescopic boom truck mounted crane, lattice boom truck mounted cranes.
Compaction Equipment- Smooth-wheel rollers, Sheep-foot rollers, Pneumatic-tire rollers.

Unit IV Construction Equipment'sfortunneling – tunnel boring machine, Drilling- its types and working methodology, types and working methodology of pumps used in construction for dewatering, pile driving equipment's, trenching machines, hauling equipment.

Unit VRoof and Roofing, cast in situ reinforced concrete roof, Thermal
Insulation and waterproofing over roofs; shell roofs. Finishing work, plastering, pointing, white washing, facing, glazing, flooring, painting, distempering. External works: Paving and Perimeter Boundaries.

Text Books

1. "Construction Planning Equipment and Methods", Peurifoy, R.L., Ledbetter, W.B.and Schexnayder, C., 5th Edition, McGraw Hill, Singapore.
2. Brown, R., Practical foundation engineering hand book, McGraw Hill Publications
3. Civil Engineering Materials, S. Somayaji,Prentice Hall, New Jersey.
4. Materials for Civil and Construction Engineers,Mamlouk M.S. and Zaniewski J.P., PrenticeHall Inc.

Reference Books

1. Roger Greeno "Construction technology", R. Chudley, Pearson Prentice Hall, U.K.
2. V. K. Jain "Hand Book of Design and Installation of Services in High Rise Building Complexes".
3. E. I. Reddy, "Advanced Materials and Techniques for Reinforced Concrete Structure (Hand Book)"

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EC04	Construction Material Management	3	0	0	3

UNIT -I

Introduction of Material Management, Integrated Materials management, Classification, codification of materials, Specification in Material Management.

UNIT -II

Material planning, Budgeting and material planning, Store Management, Store and store keeping, Storage equipment's, Material Handling, Principles of materials handling.

UNIT -III

Inventory Management Models, Inventory control, Selective inventory control, ABC/VED/GOLF /FSN, EOQ- Economic Order Quantity concept

UNIT -IV

Purchasing cycle, principles of purchasing, nature of purchasing process and vendor rating, Quality control in material management, Theory of sampling inspection, Control charts and In-process monitoring of Quality, Six Sigma Quality concept.

UNIT -V

Make or buy decisions, Buyer- seller relationship, Negotiations, Disposal and surplus, obsolete and scrap management, Performance appraisal of Materials Department, Legal Aspects of Purchasing.

Text Books

1. A.K.Chitale, R.C.Gupta, "Materials management Text and Cases", PHI learning pvt ltd. New Delhi.
2. P. Gopalkrishnan, "Purchasing and Material Management", Tata McGraw Hill Education pvt. ltd, New Delhi.
3. L.C. Jhamb, "Material and Logistics Management", Everest Publishing House, Pune-30

Reference

1. P. Gopalkrishnan, "Handbook of Material management", PHI learning pvt ltd. New Delhi.
2. K. K. Chitkara, "Construction Project Management, Planning, schedule and controlling", second edition", Tata McGraw Hill Education pvt. Ltd, New Delhi.
3. Martin K. Starr and Millar, "Inventory Management", Prentice Hall of India Pvt. Ltd.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC05	Construction Project Management	3	0	0	3

UNIT - I

Construction Project Planning: Stages of project planning, pre-tender planning, pre-construction planning, role of client and contractor, process of development of plans and schedules, job layout, principles of construction management.Importance of project scheduling, other schedule derived from project schedules.

UNIT –II

Techniques of Planning: Bar charts and Milestone Charts, Elements and basic terminologies of Networks, Event, Activity, and Dummy Activity, Guidelines for the construction of the network,Fulkerson's rule

PERT: Development of PERT network, Time estimates – Optimistic, Pessimistic and Most likely time estimates – Earliest Expected time andLatest Allowable Occurrence time. Critical Path Slack Identification of Critical Path Probability of Completion of projects.

UNIT - III

CPM: Construction of network – Earliest Possible Occurrence time and Latest Possible Occurrence time – Start and Finish times of activities – Floats – Identification of Critical Path using floats. Cost Analysis – Direct and Indirect project costs – Total costs – Cost Slopes – Crashing - Cost and Time Optimization.

UNIT -IV

Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses; Contract Duration and Price.

Planning and organizing construction site and resources– Site: site layout including enabling structures, developing site organization, Documentation at site; Resource leveling, Resource allocation. Cost and Bidding Strategy, Contractor's estimation and bidding in Indian construction industry.Construction Project Claims, Disputes and Project Closure, Causes, avoidance, mechanism of Dispute.

UNIT-V

ProjectMonitoring & Control: Supervision, record keeping, periodic progress reports, periodical progress meetings, Updating of plans; purpose, frequency and methods of updating.Common causes of time and cost overruns and corrective measures.

Computer Application :Scheduling, Resource Leveling, Monitoring and Reporting, Introduction to project management software, Function of project management software, Introduction to Illustration of MS Project and Primavera.

Text Books

1. L.S. Srinath, "PERT & CPM Principles & Applications-Third Edition", East-West Press Pvt. Ltd. –New Delhi.

2. S. Seetharaman, "Construction Engineering & Management-Fifth Edition-2015", Umesh Publications-Delhi.
3. Kumar Neeraj Jha, "Construction Project Management- Theory and Practice", Pearson Education-New Delhi.

Reference Books

1. P S Gahlot & B M Dhir, "Construction Planning & Management-Fifth Edition", New Age International Publishers-New Delhi.
2. Harpal Singh, "Construction Management & Accounts", Tata McGraw Hill Education pvt.Ltd, New Delhi.
3. K. K. Chitkara, "Construction Project Management- Planning, schedule and controlling", second edition", Tata McGraw Hill Education pvt.Ltd, New Delhi.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC06	Construction Quality Control & Management	3	0	0	3

UNIT – I

Construction Quality Management: Concept, Definition and evolution, inspection, Quality control and quality Assurance, Total quality Management (TQM), Cost of Quality.

UNIT-II

Practical Aspect of Quality Matter: Quality system in Architectural and structural Design, Drawing and Quality Audit, Aspects of Quality Management in Construction.

UNIT-III

Achieving TQM in Construction Projects: Major determinants of Quality control, Semantics of Quality, Quality Assurance Program (QAP), Templates for quality assurance, Quality dimensions for Earthwork, Quality dimensions for RCC work, Quality Audit in Construction works as per ISO 9000, TQM in Building design.

UNIT-IV

Inspection of Quality Control: Inspection benefits and item wise check list for Quality control, TQM in Building maintenance, Quality checking as per PWD /CPWD specifications and BIS codes

UNIT V

Quality Assurance: Contractor's quality assurance and Quality control plan, Laboratory for Quality control ofconstruction works, Quality effect using modern materials and construction machinery, Qualitycontrol of service lines, water supply, drainage, sewerage, sanitary installations, Qualityassurance circulars issued by CPWD.

Text books

1. S.C. Basu Roy, "Modern concept of Total Quality control and management for construction", A Nabhi Publication, New Delhi.
2. K. A. N. Talpasai, "Quality Dimensions in Civil construction", J. M. Jain and brothers, Mori gate, Delhi.
3. Kumar Neeraj Jha, "Construction Project Management ,Theory and Practice", Pearson Education, New Delhi.

Reference books

1. Projects ,Planning, analysis, selection, financing, implementation and review by Prasanna Chandra, 7th edition, McGraw Hill Education India Pvt. Ltd., New Delhi.
2. P.S. Gahlot and Deep Gahlot, "Quality Management of Cement Concrete Construction", CBS Publishers and Distributors, New Delhi.
3. Abdul Razzak Rumane "Quality Management in Construction Projects",2nd edition.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EC07	Construction Safety & Management	3	0	0	3

UNIT-I

Introduction to construction safety,Types of injuries, Factors affecting safety, Strategic Planning for safety provisions, Personal & Structural safety.

UNIT -II

Safety consideration during construction, demolition and during use of equipment. Recording injuries and accident indices. Method statement, SOPs, PPE, Inspections, Investigations.

UNIT-III

Introduction to construction management, Life Cycle of a construction project; Construction equipment and technology; Analysis for technical feasibility; Environmental Impact, Economic feasibility; Capital budgeting and investment analysis; Risk analysis in construction projects;

UNIT-IV

Safety management – Implementation and application of QMS in safety programs, ISO 9000 series, Accident theories, Cost of accidents, Problem areas in construction safety, Fall protection, Incentives, Zero accident concepts, Planning for safety, Occupational health and ergonomics.

UNIT-V

Safety and Reliability, Characteristics, functions, design consideration, quality control, performance evaluation, controlling safety hazard in Industrial and General Building construction work, Disaster Management at construction sites.

Text Books

1. Hinzie, J.W., Construction safety, Prentice Hall.
2. Rumane, A.R., Quality management in construction projects, CRC Press, T&F.
3. Li, R.Y.M. & Poon, S.W., Construction safety, Springer.

Reference Books

1. Bhattacharjee, S.K., Safety management in construction – principles and practices, Khanna publishers, 2011
2. Reese, C.D., Accident/Incident prevention techniques, CRC Press, T&F.
3. MacCollum, D.V., Construction safety engineering principles – designing and managing safer job sites, Tata McGraw Hill.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES06	Earthquake Resistant Design	3	0	0	3

Course Objectives: To impart knowledge on the fundamental structural behavior of Earthquake Resistant Buildings and their applications.

Course Outcomes: The learner will be able to understand the Earthquakes, Load Application and Principles of planning towards Earthquake Resistant design systems and basics of earthquake engineering.

UNIT - I

Seismic-resistant building architecture: Introduction; Lateral load resisting systems- moment resisting frame, Building with shear wall or bearing wall system, building with dual system; Building configuration –Problems and solutions; Building characteristics – Mode shape and fundamental period, building frequency and ground period, damping, ductility, seismic weight, hyperstaticity / redundancy, non-structural elements, foundation soil/ liquefaction. Foundations; Quality of construction and materials -quality of concrete, construction joints, general detailing requirements

UNIT - II

Design forces for buildings: Introduction; Equivalent static method; Mode superposition technique; Dynamic inelastic-time history analysis; Advantages and disadvantages of these methods; Determination of lateral forces as per IS 1893(Part1) – Equivalent static method, Model analysis using response Spectrum

UNIT III

Ductility considerations in earthquake resistant design of RCC buildings: Introduction; Impact of ductility; Requirements for ductility; Assessment of ductility– Member/element ductility, Structural ductility; Factor affecting ductility; Ductility factors; Ductility considerations as per IS13920

UNIT – IV

Earthquake resistant design of a long two-storey, two- bay RCC building: – Determination of lateral forces on an intermediate plane frame using Equivalent static method and Model analysis using response spectrum; Analysis of the intermediate frame for various load combinations as per IS1893 (Part 1); Identification of design forces and moments in the members; Design and detailing of typical flexural member ,typical column, footing and detailing of a exterior joint as per IS13920.

UNIT V

Base isolation of structures- Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic-isolation design principle; Feasibility of seismic isolation; Seismic-isolation configurations

Text Books

1. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India.
2. Seismic design of reinforced concrete and masonry buildings by T. Paulay and M.J.N. Priestley, John Wiley & Sons.
3. The seismic design handbook, Edited by F. Naeim, Kluwer Academic publishers.

References

1. Earthquake Resistant Design of Structures By Pankaj Agarwal & Manish Shrikhande, PHI Publications

2. Manish Shrikhande & Pankaj Agrawal; Earthquake Resistant Design of Structures, PHI Publication, New Delhi
3. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC08	Energy Conservation Technique in Construction of Buildings.	3	0	0	3

Course Objectives: To impart knowledge on the various energy conservation technique in construction opf buildings.

Course Outcomes: The learner will be able to understand the energy production system, concept of green buildings, smart building, management of energy.

UNIT - I:

Fundamental of energy :Energy production systems: Heating, ventilating, air conditioning, solar energy and conservation- energy economic analysis - domestic energy consumption, savings, primary energy use in buildings- residential, commercial, institutional and public buildings. Solar passive heating and cooling: elements of heating and cooling load, load reduction approaches, thermal mass. Passive heating: direct and indirect solar passive heating system: solarium, trombe wall, trans-wall.

UNIT - II

Energy and resource conservation :Concepts of green building: leed, griha, sustainble sites, water energy, materials, and indoor environmental issues for green buildings. Concept of net zero energy building.Biomass resource: characteristics, technologies for using biomass, comparison of direct combustionwith other technologies. Industrial use of biomass. Biogas.

UNIT III

Ductility considerations in earthquake resistant design of RCC buildings: Introduction; Impact of ductility; Requirements for ductility; Assessment of ductility– Member/element ductility, Structural ductility; Factor affecting ductility; Ductility factors; Ductility considerations as per IS13920

UNIT – IV

Energy in building design: Active HVAC systems, preliminary investigation, goals and policies. Energy audit: types of energy audit, analysis of results, energy flow diagram. Solar PV power plants: array design, inverter types and characteristics. Power conditioning system: working algorithms, performance analysis, design of stand alone, commissioning of PV plants. Wind and hydro energy system: basics, advantage and disadvantages, site selection, principles. Components of a wind energy converter : rotor blades, gear boxes, synchronous or asynchronous generators, towers, turbine selection.

UNIT V

Energy management:

Introduction to energy codes and policies : energy conservation act, electricity act, solar policy, hydro policy, biomass policy. Energy conservation building code – requirement of code, applicability. Planning and management of environmental system: optimization

techniques. Energy consumption in industries: energy and materials flow assessment, specific energy consumption, industry benchmarks for energy consumption.

Text Books:

1. KC Kandelwal, SS Mahdi. biogas technology – A practice handbook. Tata McGraw hill.
2. S.P.sukhatme. solar energy : principles of thermal collection and storage, tata Mc graw hill.
3. I.C Witte, PS Schmidt, DR Brown, industrial energy management and utilization, hemisphere publication. Washington,1988.

References:

1. Moore.f, " Environmental control system" Mc Graw Hill.
2. Brown, GZ Sun, " Wind and light: architectural design strategies", john wiley .
3. Cook.j award-" Winning passive solar design", Mc- graw hill .

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EE02	Energy Efficient Buildings	3	0	0	3

UNIT-I ENVIRONMENT POLICY AND PLANNING

Concepts & History of Environmental Planning. Development of habitat patterns, settlement structure and form in response to environmental challenges. Nature and extent of the energy crises. Need for implementing energy efficiency. Energy consuming sectors in the country. Environmental Policies and initiatives including policies, strategies, protocols, treaties and agreements

UNIT-II ENERGY CONSCIOUS ARCHITECHTURE

Energy classification, Sources and utilization. Principles of energy conversion, Energy demand.Factors influencing comfort in solar passive buildings. Concept of embodied energy for material & building components. Total energy need for building. Pricing of energy in developing countries, Energy utilization and efficiency in building design.

UNIT-III GREEN BUILDINGS

Role of building design and building services to evaluate the energy performance in buildings. Study of Climate and its influence in building design for energy requirement, Principles of energy conscious design of buildings. Building Envelope, Orientation, Building Configuration, Basic Principles of Day-lighting, design guidelines. Study of Thermal environment and visual environment. Maple Plants.

UNIT-IV PASSIVE SOLAR ARCHITECTURE

Classification of passive cooling systems. Minimizing cooling needs by building design:building shape & layout, orientation, size of windows, shading of window, colour of the envelope and climatic impact of plants around building. Radiative cooling The earth as a cooling source for buildings. Cooling of attached outdoor spaces. Outline of various passive systems for heat gain. Direct Gain, Indirect Gain – Trombe wall, Water wall and Transwall, Roof Pond.

UNIT-V ENERGY EFFICIENT MATERIALS

Green Materials, Biomaterials, Natural and synthetic Polymers. Adsorbent materials and solvent-based materials. Energy saving in buildings. Materials and techniques for energy harvesting. Thermo electric materials for conversion of heat to electricity. Thermal insulating coatings, paints, PVC, Creepers.

Text Books

1. Baker Nick and Steemers Koen, "Energy and Environment in Architecture", E & FN Spon, London,
2. Goulding, John, R., Lowis, Owen, J., and Steemers, Thoo, C., "Energy in Architecture", Batsford Ltd., London,
3. Bansal Narendra, K., Hauser Gerd and MinkeGiernot, "Passive Buildings Design: A Hand book of Natural Climatic Control", Elsevier Science, Amsterdam,

Reference Books

1. Givoni, B., "Man, Climate and Architecture", Elsevier, Amsterdam.
2. Smith, R. J., Phillips, G. M., and Sweeney, M., "Environmental Science", Longman Scientific and Technical, Essex, England
3. Watson Donald, "Climate Design: Energy Efficient Building principles and practices", McGraw Hill Book Company, New York,

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE03	Environment and Energy Studies	3	0	0	3

UNIT-I

Environment: The need of sustainability, Nature & Issues: Introduction to environment and the multidisciplinary nature of environment. Environment conservation and management as the key requirements of sustainability. Definitions, scope and importance, need for public awareness.

UNIT-II

Environmental Pollution: Quantification of environmental pollution, various parameters and indexes. Types of environmental pollution and pollutants. Causes, effects and control measures of Solid and e-waste management, Soil/land pollution, Radioactive pollution and Thermal pollution. Role of an individual in prevention of pollution.

UNIT-III

Social issues and the environment: Environment ethics, issues and possible solutions. Urban problems related to energy, water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns – Air, Noise, Water and Environment protection acts.

UNIT-IV

Energy – Sources, types and important aspects: Introduction to energy sources: How energy is produced and consumed, and ways in which it impacts society and the environment. Physical understanding of issues and problems involved with the generation, storage, transport, and usage of various forms of energy in technological society. Types of energy resources as Renewable and Non-renewable energy, fossil fuels and hydropower, nuclear, solar, and wind energy, and issues related to energy conservation in everyday life. Effects of waste products associated with energy generation and usage and energy conservation measures.

UNIT-V

Energy Studies: Sustainable energy policies and practices including on energy efficiency and renewable energy. Energy governance at the national and global level, Energy security, Future energy scenarios.

Text Books:

1. Raman Sivakumar, Introduction to Environmental Science and Engg. Tata McGraw-Hill, Noida, India.
2. R.L. Rag and Lekshmi Dinachandran Ramesh, PHI Learning PVT LTD., Delhi, India.
3. Subhashini Muthukrishnan, Economics of Environment, PHI Learning PVT LTD., Delhi, India.

Reference Books:

1. Dr. Suresh K. Dhameja, Society and Environment, S.K. Kataria Publisher, Delhi, India.
2. Mackenzie L. Davis and Susan J. Masten, Principles of Environmental Engg. And Science, Tata McGraw-Hill, Noida, India.
3. Cunningham Saigo, Environmental Science, McGraw-Hill Education, USA.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE05	Hazardous & Bio Medical waste Management	3	0	0	3

UNIT I Introduction:
Description of Hazardous and Bio-Medical Waste, Types of both generated from Municipal waste, E-waste and Industrial waste.

UNIT II Hazardous waste treatment:
Sustainable waste management practices, 4R principle for waste management, Physio-chemical and Biological methods (aerobic composting and anaerobic digestion), Therm o-chemical methods (Pyrolysis, gasification and incineration).

UNIT III Hazardous and Solid waste disposal:
Landfill procedure, Site selection, planning and design of hazardous waste landfill. Waste acceptance criteria. Liner and cover criteria. Sanitary landfills for municipal waste. Other methods of disposing solid waste.

UNIT IV Impact of BIO-MEDICAL Waste On Our Environment:
Impact on Environment, Effect on Atmosphere, Impact on Food and Livestock, Impact on Water and marine Eco-system.

UNIT V Biomedical Waste Management:
Source Identification, Segregation, Collection, Transportation and Disposal, Storage, Transportation Chain, Final Treatment and Disposal Including Secure Landfill.

Reference books:-

1. Integrated Solid Waste Management by Tchobanoglous/Theisen/Vigil; Publisher McGraw-Hill
2. Hazardous Waste Management, 2nd Edition, MD LaGrega, PL Buckingham and JC Evans, McGraw-Hill, 2001
3. Asolekar S.R. and Gopichandran R. Preventive EnvironmentalManagement – An Indian Perspective, Foundation Books Pvt. Ltd.
4. Hospital Waste Management and its Monitoring Sanskriti Sharma, JaypeeBrother Publishers 2002

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EE06	Industrial Waste Water Management	3	0	0	3

UNIT I

INTRODUCTION Industrial scenario in India– Industrial activity and Environment, Uses of Water by industry ,Sources and types of industrial wastewater ,Nature and Origin of Pollutants ,Industrial wastewater and environmental impacts , Industrial waste survey , Industrial wastewater monitoring and sampling ,generation rates, characterization and variables – Toxicity of Industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II

INDUSTRIAL POLLUTION PREVENTION Prevention vis a vis Control of Industrial Pollution ,Benefits and Barriers , Waste management Hierarchy ,Source reduction techniques ,Periodic Waste Minimisation Assessments , Evaluation of Pollution Prevention Options , Cost benefit analysis , Pay-back period , Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III

INDUSTRIAL WASTEWATER TREATMENT Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal. Ion exchange, Adsorption, Membrane Filtration.

UNIT IV

WASTEWATER REUSE AND RESIDUAL MANAGEMENT Individual and common effluent treatment plants ,Zero effluent discharge systems , Wastewater quality requirements for its reuse , Residuals of industrial wastewater treatment

UNIT V

CASE STUDIES Industrial manufacturing process description – Wastewater characteristics– Source reduction options and waste treatment flow sheet for Textiles, Food Processing, fertilizers, Thermal Power Plants and Industrial Estates.

Text Books

1. Nelson Leonard Nemerow, " industrial waste Treatment", Elsevier,
2. Wesley Eckenfelder W., " Industrial Water Pollution Control", Second Edition, Mc Graw Hill.
3. Soli. J. Arceivala, Shyam. R. Asolekar,Waste water Treatment for pollution control and reuse,ataMcgraw Hill.

Reference Book

1. "Industrial wastewater management, treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition.
2. Lawrence K.Wang, Yung Tse Hung, Howard H.Lo and Constantine Yapijakis "handlook of Industrial and Hazardous waste Treatment", Second Edition.
3. Metcalf & Eddy/ AECOM, "water reuse Issues, Technologies and Applications", The Mc Graw- Hill companies.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE07	Planning for sustainable Development	3	0	0	3

UNIT I

Sustainable Development- concept of sustainable development, Environmental degradation and poverty sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and alternative approaches. some important current issue and areas of debate in relation to sustainable development.

UNIT II

Innovation for sustainable development-sources of innovation, types of innovation-patterns and models of innovation, Environmental management principle of environmental management and innovation strategies, ecosystem and environment health.

UNIT III

Societal transformation- concept of community participation, need for community participation in sustainable development. case studies of community participation in health and developmeat.Institutional theory- concept of urban development plan, impact on overall development of the cities.

UNIT IV

Governance for sustainable development Relation between governance and human development, globalisation, civil society, Policy responses to Environmental degradation,UNDP policy for governance programming

UNIT V

Capacity development for innovation -Technological speciation, management innovation, managing innovation in open and close innovation system, managing innvoation through championing innovation,Research methods- foundation of research, meaning, objectives, classification of research.

Text Books

1. Hjorth P. and A. Bagheri , Navigating toward sustainable Development: A System Dynamics Appoarch , Future 38: 74-92.
2. Doathwaite, B, Enabling Innovation . A practical guide to understanding and fostering innovation, London ,Zed Books.
3. Mog. I.M, 'struggling with sustainability- A comparative frame work for EvaluatingSustainable Development programs', World Development 32(12): 2139-2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure(PDF-68kb).

Reference Books

1. M.H. Fulekar, RK kale, Bhawana Pathak Editors Publishing .
2. Author Peter Rogers, Kazi F. Jalal,John A. Boyd. Publisher Earthscan Publications Ltd.
3. Understanding susatainable Development Author John Blewitt .

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3ES08	Pre-Stressed Design of Concrete Structures	3	0	0	3

UNIT I INTRODUCTION:
Development of prestressed concrete –Advantages and Disadvantages of PSC over RCC –General principles of pre-stressing-pre tensioning and post tensioning –Materials used in PSC-high strength concrete –High tension steel-Losses in prestress.

UNIT II **ANALYSIS**
Analysis of sections – Stress concept – Strength concept – Load balancing concept-Effect of
loading on the tensile stresses in tendons – Effect of tendon profile on deflections

UNIT III DESIGN CONCEPTS
Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic
concepts in selection of cross section for bending – stress distribution in end block,

UNIT IV DESIGN PARAMETERS :Shear in PSC beams –Principal stresses – Conventional elastic design for shear-transfer of prestress in pretensioned members-transmission length –Bond stresses-bearing at anchorage –Anchorage zone stresses in post-tensioned members-.

UNIT VANALYSIS AND DESIGN :Designof end blocks by Guyon, Magnel and approximate methods –Anchorage zone reinforcements. Design of anchorage zone reinforcement – Limit state of collapse in flexural , shear and servicibility design criteria – Partial prestressing– Applications

Text Books:

1. N. Rajgopalan, Prestressed Concrete ,Alpha Science International Ltd
2. N.C. Sinha ,Fundamental of Prestressed Concrete , S. Chand Publicartions.
3. Praveen Nagarajan Prestressed concrete design , Pearson Publications.

Reference Books:

1. Raymond Ian Gilbert, Neil Micklebornugh,Prestressed concrete Design, Taylor and franns
2. H. ,Design of Prestressed concrete, Nilson wiley
3. F.Leohhardt, Prestressed concrete Design and construction, Wilhelm Ernst and shon, Berlin

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EE08	Solid Waste Management	3	0	0	3

UNIT: I Introduction:
Solid Waste: Definitions, Characteristics, and Perspectives, Types of solid wastes, , solid waste management: an overview, scope and necessity of solid waste management.Sources.

UNIT: II solid waste properties and Handling :
Sources,compositions, physical, chemical and biological properties of solid wastes,Onsite handling, storage including segregation; Collection, Recycling, Transfer and transport.

UNIT: III Solid waste processing:
Waste processing technologies, Biological, chemical and thermal technologies – Composting, Anaerobic digestion, Incineration and pyrolysis.

UNIT: IV Solid waste Energy recovery:
Energy Recovery: materials-recovery systems; recovery of biological conversion products; recovery of thermal conversion products; recovery of energy from conversion products.

UNIT: V Solid Waste disposal and Rules:
Disposal of solid waste including sanitary landfill, planning, siting, gas generation in landfill, closure of landfills, Rules and acts, issues of public participation in solid waste .

Text Books:

1. Bhatia, S. Solid and Hazardous Waste Management, Atlantic Publishers & Distributors.
2. Solid Waste Management in Developing CountriesA.L. Bhide and B .B.Sundaresan, Indian National Scientific Documentation Centre.
3. Handbook of solid waste management Frank Kreith,McGraw-Hill Education.

Reference books:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc ,2002.
3. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3ES07	Experimental Stress Analysis	3	0	0	3

Course Objectives: To impart knowledge on the fundamental of Experimental Stress Analysis and theirapplications.
Course Outcomes: The learner will be able to understand the Stress Analysis .

UNIT - I: Introduction to experimental stress analysis, advantages of ESA technique, Fundamental concept of strain measurement. Development of ERSG, types, construction and material. Gauge sensitivity and gauge factor, transverse sensitivity, correction for transverse strain effect.

UNIT – II Wheatstone bridge circuit, sensitivity, types, balancing of bridges, constant current circuit, Transducer application, diaphragm pressure transducer, displacement transducer, axial force transducer, bending force transducer, torque transducer.

UNIT III Strain Gauges - Mechanical and optical strain gauges – Description and operation –Electrical resistance- Inductance and capacitance gauges-Detailed treatment on resistant gauges – Measurement of static and dynamic strains – Strain rosettes – Effect of transverse strains – Use of strain recorders and load cells

UNIT – IV Basic optics related to photo elasticity, ordinary light, monochromatic light, polarized light, natural and artificial, Stress optic law in two dimensions at normal incidence, Material fringe value in terms of stress function

UNITV Plane polariscope, isoclinics, isochromatics, Circular polariscope, different arrangements, isochromatics, Fractional fringe measurement, Tardy's method , Babinet Solerl method, Selection and properties of model materials, Calibration methods, circular disc, tensile specimen, Separation methods, oblique incidence method, shear difference method

Text Books:

1. Dailly and Riley, Experimental stress analysis, McGraw Hill
2. Dr. Sadhu Singh, Experimental stress analysis,Khanna Publications
3. Holister,Experimental stress analysis,Dove and Adams.

References:

1. Hames W. & Riley, William F. Daily , ,Photoelasticity Vol. I, McGraw Hill
2. La Srinath , Experimental stress analysis , Tata McGraw Hill Education
3. Perry Listner ,The strain gauge primer by ,McGraw Hill

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CE3EC02	Construction Regulation and Laws	3	0	0	3

UNIT-I
Construction Contracts – Elements of Contracts- Type Of Contract -Design Of Contract Documents- International Contract Document Standard Contract Document.

UNIT-II
Tender- Prequalification – Bidding- Accepting- Evaluation of Tender- Potential Contractual Problm World Bank Procdures.

UNIT-III
Arbitration- Action- Law- Appointment Of Arbitratior Power Rule of Evidence. Claims And Disputes; Arbitration Case Studies;

UNIT-IV
Legal Requirenment- Insurance- Bonding- Sale- Purchase- Land Revenue Codes -Tax Laws -Income Tax Laws- Sales Tax- Custom Duties- Influence on Construction Cost.

UNIT-V
Local Government Laws For Approval Statutory Regulations (Development Control Rules For Local Body For A Class, B Class And C Class) Town Planning Act. Labor Regulation-Social Security- Welfare Legislation-Laws Relating To Wages- Bonus And Industrial Disputes- Labor Administration- Insurance And Safety Regulations- Workmen's Compensation Act-Other Labor Laws.

Text Books:

1. Dr. V. K. Raina, "Construction & Contract Management Practice", Shroff publishers and distributors pvt. Ltd. New Delhi.
2. B. N. Dutta, "Estimating and costing in civil engineering", UBS Publisher and distributor's pvt ltd, New Delhi.
3. K.A.N. Talousal, "Practical Aspect of Tendering and Contractual Operations of Civil Work", J. M. Jaina & Brothers, Delhi

Reference Books:

1. Justice P. S. Narayana & S. R. C. Nayar, " Law of contracts with special reference to Tenders and Construction Agreement"
2. R. A. Sharma, "Handbook of Arbitration in Construction Contracts", Om Law Book House, Delhi.
3. D. Chandra Bose, "Business Law", PHI learning pvt ltd. New Delhi.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE04	Environmental Impact Assessment	3	0	0	3

UNIT-I
Concept of EIA : Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA.Environment and its components, Environmental Inventory, Environmental Impact Statement (EIS)

UNIT-II
Methods of Impact Identification : Environmental Indices and indicators for describing the affected environment, Impact Assessment Methodologies - Matrices, overlays, network analysis, check list.

UNIT-III
Impact analysis : General frameworks , statement prefication and assessment of impact of air, water, noise and socio-economic environment.

UNIT-IV
Preparation of written documentation : Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort. Public Participation in Environmental Decision making : Basic definitions, Selection of Public participation techniques, Advantages & disadvantages of Public Participation.

UNIT-V
Case studies of Industrial EIA and Water resources projects. Brief introduction about Environment legislation and Environmental Audit.

Text Book:-

1. Bram F. Noble- Introduction to Environmental Impact Assessment: A Guide to Principles and Practice-Oxford University Press-University of Saskatchewan
2. Asit k Biswas and S.B.C. AGARWALA-Environmental Impact Assessment for Developing Countries- butterworth Heinemann Ltd-New delhi
3. A.K Shrivastava-Environment Impact Assessment- APH Publishing-New Delhi, India

Reference Book:-

1. Richard K. Morgan-Environmental Impact Assessment: A Methodological Approach- Springer Science & Business Media-Australia
2. Alan Gilpin-Environmental Impact Assessment: Cutting Edge for the 21st Century-Cambridge University Press-London
3. RikiTherivel and Graham Wood-Methods of Environmental and Social Impact Assessment-Routledge-New Delhi

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3HL02	Disaster Management	3	0	0	3

UNIT – I: Understanding Disaster: Concept of Disaster – Different approaches-Concept of Risk – Levels of Disasters – Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards – Characteristics and damage potential of natural hazards; hazard assessment – Dimensions of vulnerability factors; vulnerability assessment Vulnerability and disaster risk – Vulnerabilities to flood and earthquake hazards

UNIT – II: Disaster Management Mechanism: Concepts of risk management and crisis managements – Disaster Management Cycle – Response and Recovery – Development, Prevention, Mitigation and Preparedness – Planning for Relief

UNIT – III: Capacity Building: Capacity Building: Concept – Structural and Nonstructural Measures Capacity Assessment, Strengthening Capacity for Reducing Risk – Counter-Disaster Resources and their utility in Disaster Management – Legislative Support at the state and national levels.

UNIT – IV: Coping with Disaster: Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management – Industrial Safety Plan: Safety norms and survival kits. Mass media and disaster management

UNIT – V: Planning for disaster management: Strategies for disaster management planning – Steps for formulating a disaster risk reduction plan – Disaster management Act and Policy in India – Organizational structure for disaster management in India – Preparation of state and district disaster management plans

Text Books:

1. Mrinalini Pandey, "Disaster Management", Wiley India Private Ltd, New Delhi.
2. T. Bhattacharya,"Disaster Science and Management", Tata McGraw Hill Education (India) Pvt.Ltd, New Delhi.
3. Nidhi G. Dhavan, "Disaster Management and Preparedness", CBS Publisher and Distributer, New Delhi.

References:

1. N. Pandharinath, CK Rajan, "Earth and Atmospheric Disasters Management", BS Publications, Hyderabad.
2. Dr. N. C. Asthana, "Disaster Management", Aavishkar Publishers, Distributors, Jaipur.
3. "Manual on Disaster Management", National Disaster Management, Agency Govt of India.

Syllabus of Open Elective

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
	Green Building/Construction	3	0	0	3

UNIT – I

The green Building concept,Definitions- Brownfield, Daylighting, Energy efficient, Volatile Organic Compounds, Sustainability, Zero VOC, Operative Indoor temperature, Indoor humidity, visual comfort, Acoustics, air quality, electromagnetic compatibility, Rating systems in India and world, GRIHA, LEED, etc., green building rating agencies in the world, sustainable practices used in the design and construction phases of Energy Efficient Green Buildings.Energy Savings in Homes, IGBC certification.

UNIT – II

Energy Conscious Buildings - CLIMATE AND BUILDINGS IN INDIA , Introduction ,Factors affecting climate, Climatic zones and their characteristics , Implications of climate on building design ,Urban climate,Microclimate ,Codes: National Building Code, Energy Conservation Building Codes, Renewable energy devices/systems, Solar water heating system.

UNIT- III

PRINCIPLES OF ENERGY CONSCIOUS DESIGN OF BUILDINGS IN INDIA - Introduction , Building Envelope, Site, Orientation, Passive Heating, Direct Gain ,Indirect Gain, Thermal storage wall, Roof top collectors, Isolated Gain, Solarium (Attached greenhouse / sunspace), Passive Cooling, Ventilation Cooling, Cross ventilation, Wind tower, Induced ventilation, Natural cooling ,Evaporative Cooling ,Passive downdraft evaporative cooling (PDEC) ,Roof surface evaporative cooling (RSEC) ,Direct evaporative cooling using drip-type (desert) coolers, Natural ,Radiation Cooling ,Desiccant Cooling, Earth Coupling ,Earth-air pipe system ,

UNIT – IV

Daylighting ,Basic Principles of Daylighting ,Daylighting Systems, Sunshades ,Window design, Double glazed windows , Reduction in Energy Demand, Onsite Sources and Sinks, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources.

Water management – Conservation, Recycling/Reuse, Low impact development, Native Landscaping, Low Energy Approaches to Water Management. Management of Solid Wastes, Management of Sullage and Sewage.

UNIT – V

Building materials: sources, methods of production and environmental implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings Alternative Building Materials.

Embodied Energy of Buildings: Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes.
Handling of non process waste, waste reduction during construction,materials with recycled content,localmaterials,materialreuse,certified wood ,Rapidly renewable building materials and furniture

Text Books

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill
3. Climate Responsive Architecture. TataMcGraw Hill

Reference Books

1. Sustainable Building Design Manual. Vol 1 and 2. Teri, New Delhi
2. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill
3. Mili M. Ajumdar (Ed) Energy Efficient Building in India. Teri and Mnes.